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Analysis of Unplanned Extubations at a University Neonatal Intensive Care Unit

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ANALYSIS OF UNPLANNED EXTUBATIONS AT A UNIVERSITY NEONATAL INTENSIVE CARE UNIT

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Abstract

Unplanned extubations represent a serious adverse event that occurs within neonatal intensive care units. The current literature on unplanned extubations suggests that the incidence of these events can be reduced in the clinical setting. UEs represent the primary respiratory-related adverse event in the neonatal intensive care unit (NICU) and can result in cardiopulmonary collapse requiring emergent reintubation (Carvalho, Mezzacappa, Calil, & Machado, 2010). Staff members of the University of Louisville's neonatal intensive care unit collected data surrounding unplanned neonatal extubations from November 2017 through December 2018. These data have been used to target modifiable risk factors temporally associated with unplanned infant extubations in an attempt to provide clinically relevant extubation data. The goal of this project is to inspire future evidence-based, quality improvement studies to inform evidence-based clinical policies surrounding unplanned extubations.

Key words: unplanned extubation; neonatal intensive care unit

Analysis of Unplanned Extubations at a University Neonatal Intensive Care Unit

Unplanned extubations (UE) are simply described as the unintended removal of an endotracheal tube (ETT) from the trachea of an intubated patient. The unplanned extubation of a neonate represents a preventable adverse event in the healthcare setting. Specifically, UEs represent the primary respiratory-related adverse event in the neonatal intensive care unit (NICU) (Carvalho, Mezzacappa, Calil, & Machado, 2010). The frequency of UEs is 0.11 to 1.26 UE per 100 days of mechanical ventilation (MV) in pediatric populations and 1.98 to 3.0 unplanned extubations per 100 days of MV in the NICU population (de Oliveira, Cabral, Schettino & Ribeiro, 2012). Advances in the use and management of mechanical ventilation (MV) have directly improved infant survival rates, but the incorporation of this life-saving intervention is not without complications and risks. The unplanned removal of the ETT is one of the most serious risks associated with the use of MV on intubated patients (Powell, Gilbert &Volsko, 2016).

Unplanned extubations (UE) often represent emergent events that result in urgent reintubations, which have potential to become chaotic in a moment of impending patient decline (Loughead, Brennan, DeJuilio, Camposeo, Wengert & Cooke, 2008). Intubating an infant can be a stress-provoking procedure that can easily result in injury to the delicate airway of the neonate. Extubation can result in emergent reintubation which can cause injury to a neonate's airway and result in stridor, intracranial ventricular hemorrhage, hypoxemia, cardiopulmonary collapse, or pneumonia (Carvalho, Mezzacappa, Calil, & Machado, 2010). The incidence of cardiac collapse following an UE is as high as twenty percent (Carvalho, Mezzacappa, Calil, & Machado, 2010). Cardiac crisis may result in the need for cardiopulmonary resuscitation prior to reintubation of the neonate (Roddy, Spaeder, Pastor, Stockwell &Klugman, 2015). While intubation is not a

significant source of mortality for infants in the NICU, the associated risk of pain, injury, and illness can lead to substandard patient outcomes, longer hospital admissions and increased hospital costs (Roddy, Spaeder, Pastor, Stockwell & Klugman, 2015).

As previously stated, current research suggests the frequency of UEs in NICU patients is between 1.98 to 3.0 per 100 days of MV (de Oliveira, Cabral, Schettino & Ribeiro, 2012). However, the acceptable benchmark for UEs in the NICU is not consistent in current literature, ~~but~~ most researchers and hospital organizations reference 1 UE per 100 ventilator days as an appropriate standard of care (Roddy, Spaeder, Pastor, Stockwell &Klugman, 2015). In comparison to intubated infants who do not have an UE, neonates who experience an UE can be expected to experience an average of 5.5 additional days in intensive care and an overall hospital admission extended by an average of 6.5 days (Roddy, Spaeder, Pastor, Stockwell & Klugman, 2015). The occurrence of an UE results in increased hospital expenses, totaling as much as $36,000 per event, which unnecessarily increases the already costly intensive care admission (Roddy, Spaeder, Pastor, Stockwell & Klugman, 2015). These statistics highlight the increases in both the length of hospitalization and the added hospital expenses that are associated with this preventable event. Considering 62% of all medical expenses are funded by the federal government, UE represent a potentially preventable added expense for tax payers nationwide (Craiglow, 2018). The adverse health risks to neonates and the increased financial burden on the healthcare system nationwide necessitate the need for continuing investigations to inform clinical practice and prevent UE in the NICU.

Theoretical Framework

The conceptual framework integrated with this project is the Synergy Model (Figure 1). The Synergy Model is considered a nursing competency framework in which the patient's healthcare requirements motivate the nursing competencies required for patient care (Pate, 2017). The Synergy Model empowers nurses by highlighting autonomy in both the practice and work environment, while also focusing on the needs of the patients when determining the allocation of healthcare resources (Pate, 2017). This model recognizes the unique differences and individualities of both a diverse patient population and the nursing workforce, while facilitating and promoting optimal health goals (Pate, 2017). When nursing competencies and patient characteristics are coordinated in critical care environments, superior patient outcomes result (Pate, 2017). Neonates in the NICU are minimally resilient, highly vulnerable, and very unpredictable. The challenges represented by this patient population necessitate exemplary nursing judgment, aptitude, and critical thinking. This project embodies the Synergy Model by identifying patient needs to help prevent the incidence of UEs, and matching those needs with the highly skilled nursing characteristics within the unit in order to promote optimal outcomes.

Setting and Organizational Assessment

This project was implemented at the University of Louisville's neonatal intensive care unit. This NICU is a 28-bed, intensive care unit for ill term infants and viable premature neonates aging from 22 weeks gestation and older. According to the Vermont Oxford Network (VON) (2017) Membership Survey, this NICU consists of 18 intensive care beds and 10 intermediate stepdown beds. The unit admitted a total of 306 infants to the NICU in 2017 with birthweight frequencies as follows: less than 501 grams (1.6%), 501 to 1000 grams (8%), 1001 to 1500 grams (7.8%), 1501 to 2500 grams (35%) and greater than 2500 grams (47.7%). The

hospital experienced 1,874 deliveries in 2017. Obstetrical services at this facility are categorized as level III, indicating that the facility is capable of providing services for all serious illness and abnormalities and is supervised full time by a maternal-fetal specialist. The hospital also encompasses 45 newborn nursery beds for healthy neonates that are followed by the pediatric physician team.

The NICU cares for infants with a variety of life-threatening conditions including, but not limited to, extreme prematurity, drug withdrawal, sepsis, hypoglycemia and cardiopulmonary disease. This NICU is proficient in providing sustained life support and care for neonates <32 weeks gestation or < 1500grams. This unit has access to a range of pediatric specialists who can provide a full range of respiratory support, including high frequency ventilation and inhaled nitric oxide, and possesses the ability to perform advanced imaging with timely interpretation. The core staffing model for one worked shift consists of nine registered nurses and one respiratory therapist. This respiratory therapist may have responsibilities on the Labor and Delivery and Mother/Baby units, but their primary area of responsibility lies within the NICU. The unit uses the American College of Obstetricians and Gynecologists (ACOG) staffing and acuity guidelines as a framework for allocating staffing resources. For example, a sick infant on a ventilator receiving intravenous medication drips would be considered a 1:1 assignment, indicating that one staff nurse is to be assigned to care for this infant and this infant alone. Infants who are medically stable and requiring a ventilator, continuous positive airway pressure, or oxygen can usually be considered 2:1. In this scenario, the care of two neonates could safely be assigned to one staff nurse. Further, transitional infants (“feeders and growers”) can be 3-4:1 assignment, so a nurse could be assigned to care for 3 to 4 of these infants during their shift. In

addition, infants with neonatal abstinence syndrome are placed in the 2:1 category whenever possible because their nursing-related care often proves to be quite time-consuming.

A pediatric attending physician and a pediatric fellow physician, along with two to three pediatric resident physicians, staff the unit daily from 07:00 until 17:00. A neonatal nurse practitioner is also present on the unit throughout the day, while night shift is covered by an on-call nurse practitioner who remains in close proximity to the unit overnight. The overnight nurse practitioner is also responsible for coverage of care for infants contained within the newborn nursery. A number of board-certified specialist physicians practice within this NICU and their areas of expertise include: cardiology, neurology, pulmonology, infectious disease, hematology, endocrinology, nephrology, gastroenterology, and genetics. There are currently 14 board-certified neonatologists on staff who rotate their shifts between three additional healthcare systems. Pediatric surgeons are not available on-site, but can be accessed for coordination of care at a nearby and related institution (VON,2018).

Purpose

New policies and changes in practice can be developed when units are able to recognize the current deficits that impede meeting expected and accepted expectations. Unplanned extubations are still occurring within the NICU at the University of Louisville Hospital, despite having efforts in place to reduce the incidence of this phenomenon. I examined the data collected by the staff within this NICU to identify temporally associated and modifiable risk factors of UE in order to provide data-driven contributions to current clinical practice. After sharing the results of this project with the unit, the hope is that the unit will be able to identify modifiable risk factors associated with UE and develop opportunities to incorporate evidence-based practice and quality improvement initiatives in future UE research within this NICU. This project was a

contribution toward the unit's effort of improving practice, and it sought to explore the variables that could be better controlled in future research in order to decrease UE rates.

Intervention

Data reported on the data collection tool (Appendix A) were collected and analyzed in order to identify potential variables which co-occur at the time of an UE or shortly after the event. These forms were completed by NICU staff members following an UE. First, the total number of UEs was determined based on the number of data collection tools submitted for each unique UE event with the caveat that multiple UEs could have occurred on the same baby. An assumption of the study is that every UE that occurred in the unit was associated with data collection tool documentation since this is the unit's policy and expectation of staff. Percentages and frequencies were used for questions 1 through 9 on the data collection tool. For example, out of the total number of UEs, how many of those were noted to have "loose tape" by the provider completing the form? Variables demonstrating high frequencies may indicate a modifiable risk factor for unplanned extubation or could represent a serious safety event. Hypothetically, if the results indicate that 90% of the unplanned extubations occur during kangaroo care compared to other types of patient handling, then future research may be directed at examining evidence for safest practices in providing kangaroo care. This represents one example of how the results from this study can potentially impact future clinical research in an effort to decrease UE. The narrative portion of the form was thematically organized based on the content of the narrative by the provider filling out the collection tool. This section allowed staff to place additional concerns or observations that may further contribute to the description of UE. For UE events where multiple forms were submitted on a single event, the data were consolidated into a single form when data were the same across all forms. Some parts of the forms were not filled out to

completion and were recorded as undocumented in the data tables. Permission for this project was granted by the University of Louisville NICU hospital administration and approval granted by the Nursing and Interdisciplinary Research Council at the University of Louisville Hospital. The study was also reviewed and deemed to be non-human subjects research by the Institutional Review Board at the University of Louisville.

Participants

Participants in this study included intubated neonates, from 22 weeks gestation and greater, who experienced one or more UE during the infant's NICU admission. All neonates in the NICU who experienced an UE and had an UE data collection sheet (see Appendix) filled out by a NICU staff member following the UE event were included in the analysis for this study.

Data Collection and Measurement

Starting in November of 2017, staff in the NICU completed a data collection tool (see Appendix) accompanying each UE occurrence. The data collection tool closely examines evidence-based variables occurring at the same time of the UE such as (a) the ventilator mode, (b) nurse staffing assignments, (c) sedation stages, (d) activities and procedures, and (e) infant outcome. The data collection tool contains a narrative section where staff can contribute other pertinent information surrounding the UE. Whenever an UE occurs, a NICU staff member involved in the care of the infant filled out the data collection tool then filed the tool with the unit manager. The form was filled out once the infant had been stabilized, but as soon after the event as possible in order to provide for timely and accurate reporting of the extubation. The infant's hospital identification sticker was placed on the form, but was redacted from forms included in this project in order to maintain patient confidentiality. Variables on the data collection form that were incomplete were noted as undocumented.

The specific data collection tool (see Appendix) used in this NICU was adopted prior to the start of this project. The form was adopted from another local NICU. Unit staff educated NICU team members on the appropriate use of the form prior to the start of this project. The data collection tool provided access to certain variables from the literature, but not all variables identified in the review of literature were included. For the purposes of this study, the existing data collection tool currently being implemented in the NICU was utilized for this study and opportunities for improving the tool will be discussed later in the paper.

Results

Twenty-two total unplanned extubation forms were collected from November 2017 through December 2018. Five infants experienced repeat unplanned extubations during the data collection timeframe. Table 1 provides a display of frequencies of UE corresponding with variables identified in the literature. Of the forms collected, 40.9% had a prior history of unplanned extubation, 36.4% had no history of UE, and 22.7% were undocumented UE occurred on dayshift 22.7% and 72.7% on nightshifts with 4.6% (n=1) undocumented. The ETT tape was reported secure in 81.9% of the documented UE and unsecured in 13.6% of events. One UE form did not have the condition of the tape recorded (4.6%). In 9.1% of the cases the ETT was positioned in the center of the infant's mouth, and the ETT was in the corner of the infant's mouth in 68.2% of UE events. Five forms (22.7%) did not include information about the location of the ETT in the infant's mouth. Conventional mechanical ventilation was being used in 59.1% of the UE events, with HFV in 27.3%, Neurally adjusted ventilatory assist (NAVA) in 9.1% and 1 form (4.5%) was without a ventilation mode documented.

Table 1

Evidence-Based Associations with UE

Variable		n	%
History of UE			
	Yes	9	40.9
	No	8	36.4
	Undocumented	5	22.7
Shift			
	Day shift	5	22.7
	Night shift	16	72.7
	Undocumented	1	4.6
Tape secured			
	Yes	18	81.8
	No	3	13.6
	Undocumented	1	4.6
ETT location at mouth			
	Center	2	9.1
	Corner	15	68.2
	Undocumented	5	22.7
Mode of ventilation			
	NAVA	2	9.1
	High Flow Ventilation	6	27.3
	Conventional	13	59.1
	Undocumented	1	4.5

Evidence-based risk factors for UE are displayed in Table 2. A majority of the UE occurred in the acute phase of treatment (63.6%) which occurred while care was escalating or static, while 36.4% occurred during the weaning phase while the patient was improving and ventilator settings were deescalating. Only 18.2% of the infants were on continuous sedation, 0% were on PRN or as needed sedation and 81.8% of infants were reported as receiving none or inadequate sedation. Nursing assignments with one nurse and one patient were cited in 18.2% of UEs, while an assignment with one nurse and two patients was observed in 72.7% of UE events. One nurse with a three infant assignment was recorded in 4.5% of UE events. One form (4.5%) did not

have staffing information documented. Proper shift handoff was reported in 86.4% of events while 3 forms (13.6%) did not have handoff information documented. Of the infants who experienced an UE, 81.8% required reintubation within one hour following the extubation and 18.2% were able to remain extubated on other non-invasive forms of respiratory support.

Table 2

Evidence-Based Risk Factors of UE

Variable	n	%
Phase of Treatment		
Acute	14	63.6
Weaning	8	36.4
Awaiting extubation	0	0
Sedation		
Continuous	4	18.2
PRN	0	0
None or Inadequate	18	81.8
Staffing		
1:1	4	18.2
1:2	16	72.7
1:3	1	4.5
Undocumented	1	4.5
Proper Handoff		
Yes	19	86.4
No	0	0
Undocumented	3	13.6
Retinutbation w/i 1 hour		
Yes	18	81.8
No	4	18.2

Events occurring after the UE are displayed in Table 3. An infant experienced a heart rate less than 60 beats per minute in 12 UE events (54.5%). The need for increased ventilator support or oxygen requirements was observed following 11 UE (50%). One infant required chest

compressions following an UE. None of the infants required the administration of code medications or experienced cardiac arrhythmias or blood pressure changes following an UE.

Table 3

Events Resulting After UE

Variable	n
HR <60 bpm	12
Need for increased vent support/FiO2	11
Chest compressions	1
Arrhythmia	0
Code medications given	0
BP Δ requiring interventions	0

Contributors to UE are displayed in Table 4. Loose tape was documented 5 UEs, and emesis was documented in 3 UEs. Infant agitation, excessive secretions and the presence of a mucous plug were each documented in 2 UE events. Surfactant occlusion, thick secretions, circuit tube tension, patient removal, ETT tape change, and extubation within an hour of NICU admission were each documented once.

Table 4

Contributors of UE

Variable	n
Loose tape	5
Emesis	3
Mucous plug	2
Excessive saliva/secretions	2
Agitation	2
Surfactant occlusion	1
Within 1 hour of NICU admission	1
Thick secretions	1
Circuit tubing tension	1
Δ ETT tape	1

Pt self removal	1

Activities concurrent with the UE are displayed in Table 5. UE occurred most frequently during patient assessment (n=6), while 4 UE were unwitnessed by staff. Two UE occurred with the repositioning of a patient, 2 occurred with adjusting and re-taping the ETT, 2 happened with suctioning and 2 UE occurred at a time when fewer than 2 nurses were bedside during patient care.

Table 5

Activities Concurrent with UE

Variable	N
Patient assessment	6
Unwitnessed	4
Repositioning	2
Adjust/retape ETT	2
Suctioning	2
<2 RN at bedside	2
Pt decline	1
Xray	1
ETT assessment	1
Δ isolette/bed	1

Discussion

Interpretation

The information gathered from this study provides useful direction towards future UE research in this NICU in an effort to effect practice and promote evidence-based practice. While

there are opportunities for improvement in completing the data collection forms, the information collected through this project provides helpful guidance for developing future evidence-based, quality improvement studies to inform evidence-based clinical policies surrounding intubated neonates. It is best to consider which factors are modifiable when considering future quality improvement research goals.

Prior history of UE. History of unplanned extubations is not necessarily a modifiable risk factor, however identifying infants with previous UE as infants with "critical airways" may help to bring greater staff attention to the handling and care received by this patient population.

ETT location. With almost one-third of the ETT tube location undocumented, it is impossible from this data set to determine if this factor is a significant contributor to UE events.

Mode of ventilation. Mode of ventilation is not a characteristic that would likely be changed only because of an UE. Many factors contribute to the selection of mode of mechanical ventilation including infant tolerance and unit availability. It is difficult from this limited study dataset to determine if more UE occurred on conventional ventilation systems due to the characteristics of the system alone, or if it is because this is the more common mode of mechanical ventilation utilized in this particular unit.

UE and nursing shift. There is some conflicting evidence in the literature concerning the time of day and te occurrence of UEs. da Silva, Farah & Fonseca (2017) observed that there was no relationship between the time of day and presence of UEs when nurses worked 12-hour shifts. A majority of the UE events identified within this project occurred during night shift hours. This may be because more UE events occurred during the night shift or due to more thorough reporting of UE during this time. A major increase in the risk for adverse events in the NICU has been identified when there is a decreased nursing presence. Carvalho, Mezzacappa, Calil, and

Machado (2010) found that 79.1% of UEs occurred when patients were not being diligently observed which highlights the importance of nursing staff having the ability to spend adequate time at the bedside of their patients. It is significant to mention that while most UE occurred during night shift hours, there was also less provider coverage during these hours as the nurse practitioner was responsible for coverage of the NICU and the newborn nursery. Nursing shift and unplanned extubations represents a potentially modifiable factors where future studies surrounding UE within the unit may focus on exploring the reasons for discrepancies between the two nursing shifts and UE events.

Phase of treatment, sedation and handoff. The phase of treatment is not a modifiable risk factor for this study. It is not unusual for infants in a NICU to be intubated for weeks with minimal sedation medications due to a concern for poorer pulmonary outcomes and longer hospitalizations (Merkel, Beers, Lewis, Stauffer, Mujsce & Kresch, 2014). The lack of sedation in NICU patient populations results in increased patient movement and an increased risk of UE. While risks and benefits of sedation must be considered within the NICU patient population, the use of such medications in intubated neonates may help decrease the occurrence of UE by preventing dislodgement of the ETT by the patient. Reporting of sedation on this form could be improved as the current method is subjective and lacks enough description to make reporting uniformed across UE events. The options of none and inadequate sedation are grouped together as one option, however these two categories represent very different levels of sedation interventions. Proper handoff was noted on almost all of the forms. It is unlikely that pursuing this feature would be worthwhile in future UE research.

ETT securement. Loose tape was the most frequently documented contributor to UE events in this study. A systematic review of eight articles performed by da Silva, Farah &

Fonseca (2017) found that the meta-analytic mean incidence of UE due to loose tape securing the ETT was 19%. Another study found that the presence of loose and wet ETT tape increased the risk of an UE by an odds ratio of 10.4 (da Silva, Farah & Fonseca, 2017). The warm and moist environment that is essential in the appropriate care of preterm and low birthweight infants presents a grueling barrier in ensuring adequate tape adhesion to the tiny infant faces (Powell, Gilbert & Volsko, 2016). According to da Silva and Caralho (2010), a superior method of ETT fixation for minimizing tube displacement could not be identified through a systematic review of the current literature and best practice recommendations. In fact, improvements in ETT stabilization were more likely due to meticulous staff attention and rigorous monitoring rather than one attachment technique (da Silva & Caralho, 2010). While one ETT securement method has not been identified in the literature as superior in preventing UE, both Loughead, Brennan, DeJuilio, Camposeo, Wengert and Cooke (2008) and Merkel, Beers, Lewis, Stauffer, Mujsce and Kresch (2014) conclude that the use of a standardized, consistent fixation method results in a decreased incidence of UEs. This is further supported by Fitzgerald, Davis and Hanson (2015) who reported that infants were at an increased risk of UEs if their ETT was not taped to an individual unit's standard. Future UE research within the NICU at the University of Louisville should continue by exploring the unit's ETT stabilization methods and ETT surveillance policies in order to explore associations with ETT securement and UE events. While further research surround tape securement is a variable that should be considered in future UE research in this unit, it should be mentioned that the report of tape securement tended to conflict with reporting of loose tape. Several forms were marked as taped secured, but then mentioned loose tape as a contributor of the UE. These variables appear to be contradictory and will need further specification in future research efforts.

Patient assessment. Patient assessment was the most common activity occurring around UEs, suggesting it would be reasonable to pursue future exploration into patient handling strategies to decrease UE. Improvements in UEs were observed in the current literature when two licensed staff members were involved in handling intubated patients at the bedside (Merkel, Beers, Lewis, Stauffer, Mujsce & Kresch, 2014). Infant flexion and extension results in the range of movement of the ETT from 7 to 28 mm (da Silva & de Carvalho, 2010). This range of ETT movement can result in the tube displacement out of the airway due to the short tracheal anatomy of small neonates (da Silva & de Carvalho, 2010). The ETT shifts over 40% of the length of the infant's trachea with simple head movements (Crezee, DiGeronimo, Rigby, Carter & Patel, 2017). Further quality improvement studies examining the role of staff policies and practice around patient manipulation may help uncover areas of improvement towards decreasing unplanned extubations in this unit.

Reintubation rates. Low reintubation rates following an UE should direct providers that opportunities are being missed to identify infant readiness for extubation (Roddy, Spaeder, Pastor, Stockwell &Klugman, 2015). In this study, over 81% of the infants required reintubation following the UE, suggesting these infants were not ready for deescalation of respiratory support. Cardiopulmonary declines were noted on several of the UE data collection forms, indicating that UE represent a dangerous scenario for this fragile infant population. Following an UE, infants required increased ventilator support and increased staff support. The acuity of these patients increased following an UE as reintubation and careful monitoring were required subsequently to the extubation.

Limitations

There are some limitations to this study. First, the quality of the information is only as good as the quality of reporting on UE. Some forms had missing or undocumented data that complicated interpretations of the data. For example, it was impossible to determine if the question was left blank because it did not apply, or if it was overlooked but relevant to the UE event. In the future, it might be beneficial to data collection for this information to be included in the electronic health record so that staff can chart all of the significant fields following an UE.

Electronic charting of UE event data would also make it easier to generate reports surrounding UE data specific to the unit and eliminate the burden of keeping multiple paper records organized and secure. Some variables, as mentioned previously, appear to contradict other reported variables in the form. An additional example of this involves the contradictory reporting of patient decline in contrast to variables reported under events resulting after an UE. Only one UE was marked as having a patient decline occurring around an UE, however several UE forms were marked as the infant experiencing heartrate drops and the need for increased respiratory support, two variables that might be considered a decline in patient status.

Since the data are only based around a subset of the population (infants who experienced an UE), there was not enough information about the population to perform statistical analysis. If future research collects UE and non-UE data for the total population of intubated neonates, then further statistical analysis can be performed to determine how well the observed distribution of data fits with the distribution that is expected if the variables are independent.

It might also be beneficial for a staff role to be assigned the sole responsibility of completing the UE form after an UE occurs. For example, it would be reasonable that the nurse caring for the infant with an UE event be responsible for filling out the UE form as this individual would have likely have the most information about the infant and the UE. During the

data analysis phase of this study, it was noted that some UE events were recorded by multiple staff members including the nurse, respiratory therapist and/or provider. This resulted in multiple UE event forms filled out for a single event and these forms eventually had to be consolidated into a single form. In this study, the multiple forms on an UE were congruent, but if discrepancies between the forms had existed between forms it would have complicated the descriptions of the UE event.

Conclusion

UEs are a multifaceted problem that require multifaceted solutions. The focus of immediate practice reform should derive from targeting modifiable risk factors from the available observational studies (da Silva, Farah & Fonseca, 2017). The information gathered through this project offers many opportunities for future research surrounding UE in this NICU in an attempt to effect practice and promote evidence-based practice. Ultimately UEs result in longer hospitalizations, increase costs and increased discomfort for sick infants. Providers sharing and discussing the data gathered on UEs creates an opportunity to learn about the successes and failures of interventions (da Silva, Farah & Fonseca, 2017). Education and awareness of UEs plays a vital role in supporting staff attentiveness while caring for intubated infants. Current literature suggests emphasis on the collection of UE data influences the reduction of UEs simply through improving the awareness of staff to the problem (Mehta, Sharma & Laussen, 2015). Improved tracking and educating on UEs will lead to a better insight of these avoidable events and ultimately lead to safer care and improved outcomes for patients. Ultimately the limitations in this study highlight the difficulty in gathering meaningful data within clinical practice. Rigorous quality improvement projects with set parameters and

definitions are needed to help to provide further meaningful data to the clinical practice of this unit.

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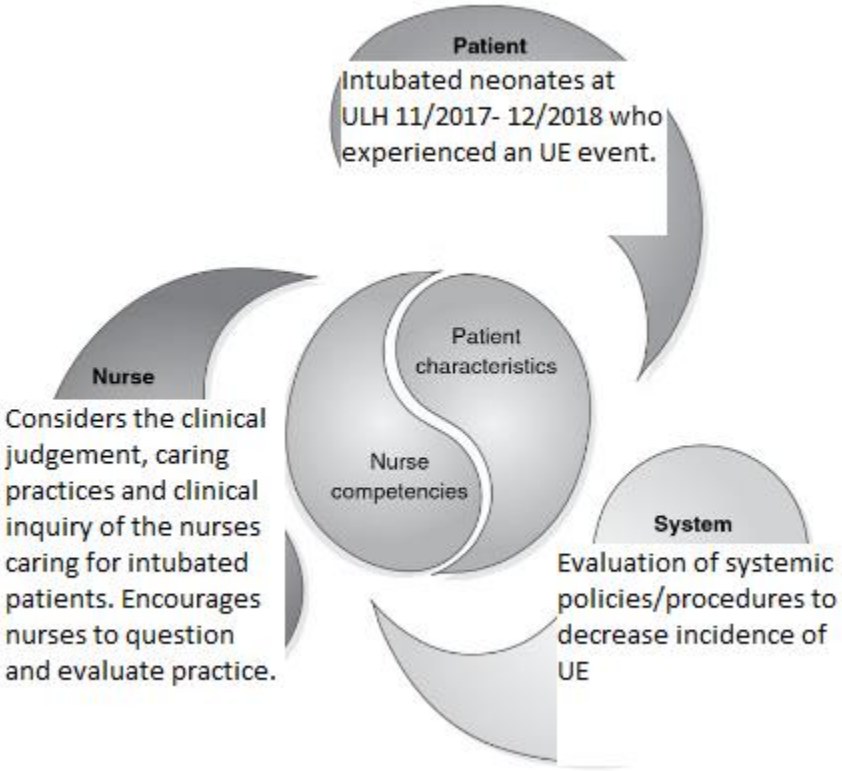
Figures



(Pate, 2017)

FIGURE 1: The Synergy Model- with special considerations for this project

Appendix A

Unplanned Extubation Data Collection Tool

NICU Unplanned Extubation (UE)
Revised 11/20/17

Date of UE Event: Time of EU Event:

Person Filling Out Form: _____

1) History of prior unplanned extubation(s) Yes/No 2)

Airway/ETT:

a. Mode of Ventilation (circle) NAVA

Conventional Ventilation

b. Tape Secure Yes/No
c. ETT corner of mouth or center of mouth (circle)

3) Phase of Treatment (circle one)

a. Acute — care is escalating or static
b. Weaning — patient is improving and ventilator settings are de-escalating
c. Awaiting extubation

4) Sedation (circle one)

a. Continuous
b. PRN
c. None or Inadequate

5) Staffing

a. Nursing assignment (circle one)

ii. 1:2

b. Proper staffing handoff Yes/No
c. Other_____

6) Contributors to UE: (circle all that apply)

a. Inadequate restraints
b. Loose tape
c. Sedation/agitation
d. Staffing
e. Within 1st hour of ICU admission
f. Other

_____

7) Activities occurring at time of extubation (circle all that apply)

a. Kangaroo care
b. Radiology study (x-ray, UIS, echo, etc)
c. Respiratory treatment
d. ETT adjustment/Re-Taping ETT
e. Weighing
f. Position change
g. Transport
h. Suctioning
i. <2 caregivers for positioning or suctioning
j. Bathing
k. Line placement
l. Blood draw
m. Other bedside invasive procedure
n. Other

8) Did event result in any of the following? (Circle all that apply)

a. Arrhythmia
b. BP requiring intervention

c. Need for increased vent Support or F102
d. Heart Rate <60?
e. Chest compressions?
f. Code medications given?

9) Did the patient require reintubation within one hour?

Yes/No

Narrative of other pertinent information surrounding the Event:

Patient Label Here